SOUTHERN CALIFORNIA EDISON®

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DRP Demonstration Workshop

Demo E - DER Dispatch to Meet Reliability Needs – Microgrid

June 28, 2016

Content for Demonstrations E

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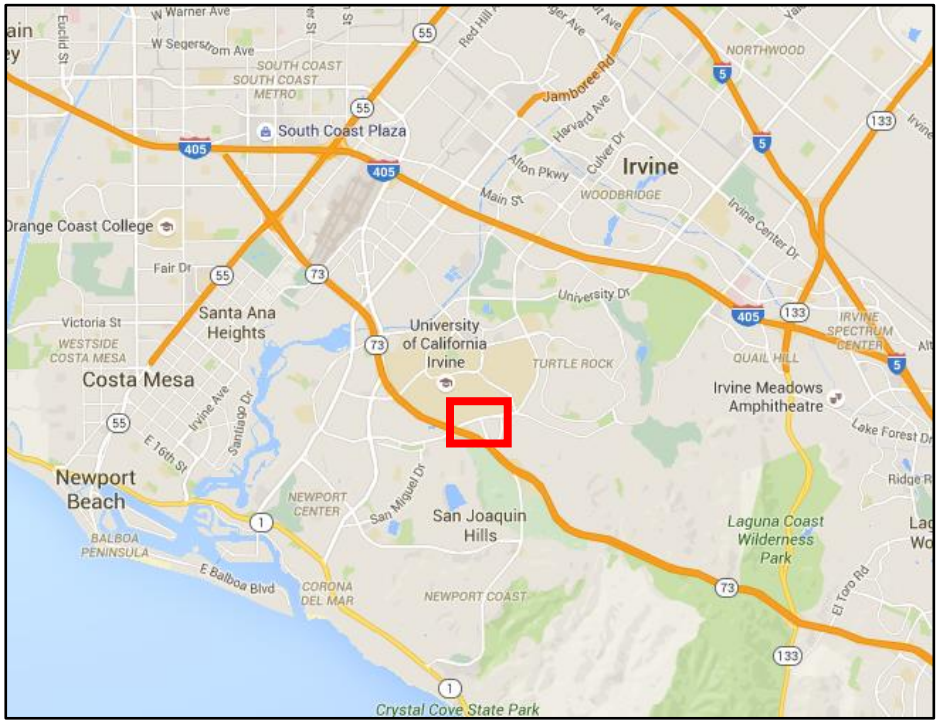
Demo E Objective and Expected Outcome

Objective:
Demonstrate the capability of managing and operating multiple DERs within a microgrid system.

Expected Outcome:
Identify microgrid design requirements to enable opportunities for enhanced resiliency and demonstrate controls and protocols for safe, minimally disruptive islanding and reconnection.



Residential neighborhood adjacent to UC Irvine

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Demo E: Summary of Project Proposal

Scope

- Design, construct, and operate a microgrid to support customer load through one or more dedicated control systems.
- Demonstrate safe and reliable dispatch of utility, third-party and customer resources connected to the microgrid while in islanded or grid-connected mode.
- Assess needs and effectiveness of management systems in the coordination of available DER.
- SCE estimated cost: $10.2M

Approach

- Establish customer requirements for a microgrid and obtain commitment and partnership from customer(s) and seek collaboration with third parties
- Create “islandable” microgrid on subsection of circuit (Irvine) consisting of 150 residential customers
- Utilize resources from customers / third parties to meet island duration target
- Validate microgrid control strategies in laboratory environment
- Evaluate microgrid performance through nine month field demonstration

Key Milestones	
Initiate project	Q4 16
Complete requirements and specifications	Q2 17
Issue RFP to procure utility resources	Q4 17
Select third party DER vendor to provide energy services	Q1 18
Complete microgrid control system lab testing	Q4 18
Initiate microgrid measurement and verification field testing	Q1 19
Complete field testing	Q4 19
Issue final report	Q2 20

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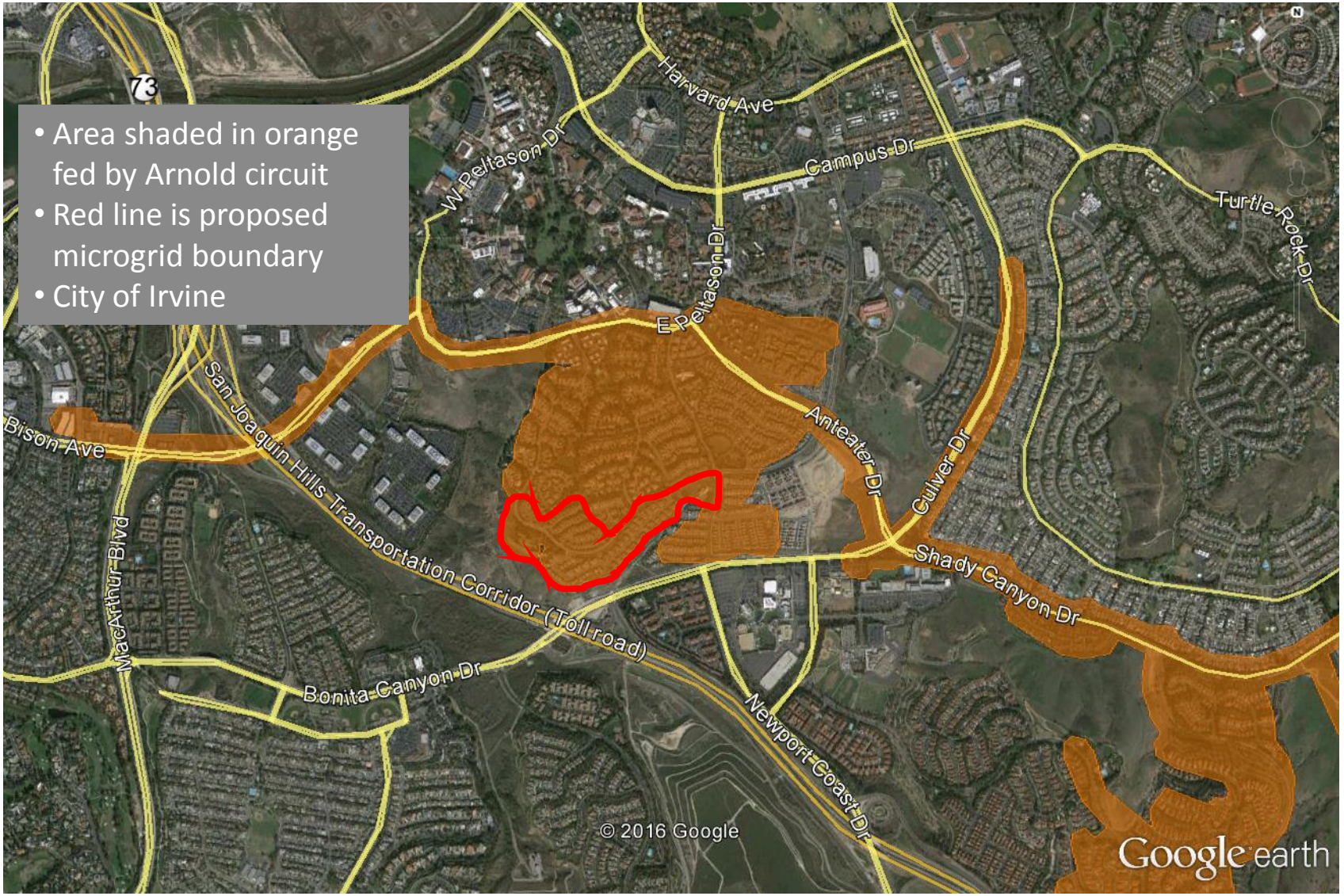
Proposed Location Overview



*General direction of circuit

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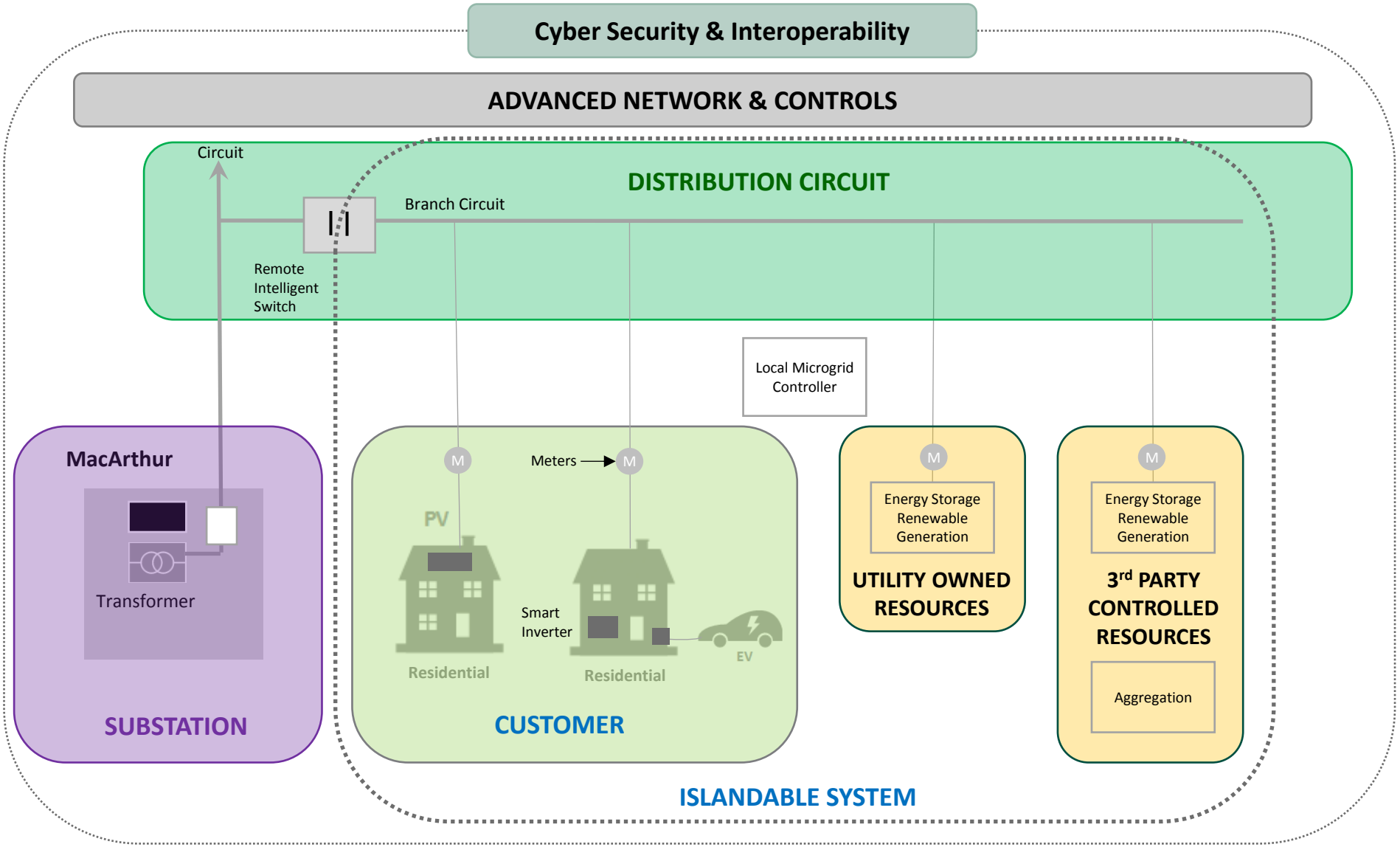
Demo E Rationale

- SCE defines a microgrid as a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island-mode.*
- Eight locations were scored along various dimensions, resulting in selection of residential site adjacent to UC Irvine; key factors included
  - Customer interest: Facilitates learning objective of transitioning the microgrid to and from island mode with minimal disruption of service
  - Circuit topography & availability of space for new equipment: Facilitate learning objective of maintaining the microgrid in island mode for any two-hour period with utility-owned, third-party and customer resources while maintaining power delivery standards
- Outsourcing strategies facilitate learning objective of engaging third parties in the supply of products and services to support microgrid requirements
  - Project approach based on 3rd party resources / aggregation delivering majority of energy required to meet island duration target
- Control system development strategy facilitates learning objective of implementing protection schemes for inverter-based microgrids which will allow for safe and reliable operation of the microgrid

*U.S. Department of Energy Microgrid Exchange Group

Demo E Conceptual Diagram



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Demo E Cost Overview

Demonstration E: SCE Implementation Cost Estimate		
Activity	**Est. Amount ($'000s)**	
Design and Engineering	$	900
Equipment and Services	$	6,000
Laboratory Testing	$	450
Community Engagement	$	650
Measurement & Validation (Data Analysis)	$	450
Project Management	$	850
Maintenance and Decommissioning	$	900
Total	**$**	**10,200**

- Design and engineering
  - Systems engineering
  - Specifications for all subsystems and major components
- Equipment and services
  - Advanced controls
  - Back office computing systems
  - Field area network devices
- Laboratory testing
  - Verify interoperability prior to field deployments

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Demo E Expected Outcomes

	Potential Demonstration Results
Reliability	• Increased reliability when circuit outage and microgrid is islanded
Technology	• Communication and control utility interfaces that enable dispatch of 3rd party resources for enhanced resiliency / reliability
Capability	• Understand how a utility microgrid can become a tool for increased resiliency / reliability • Increased knowledge of DER planning, siting and operations • Increased knowledge of system protection when physically disconnecting from the grid
Societal	• Potential to "unlock" additional DER value, which accelerates and expands use of renewable resources

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Questions

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